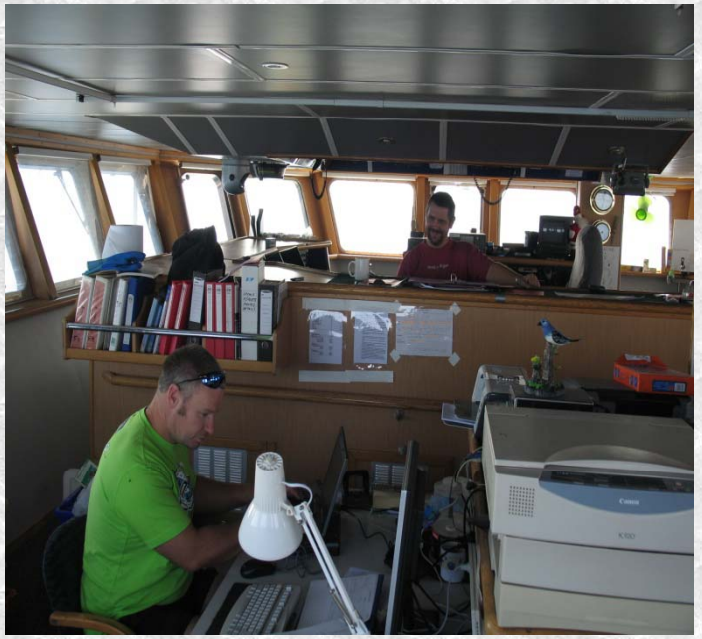
A robust, low cost, GIS enabled data capture & management system for commercial/research vessels.

Brent Wood
&
Gavin Macaulay



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Wanted!

a robust, spatially enabled system for capturing & managing:

- Trawl data: trawl station, catch and biological data
- Oceanographic data: CTD & dissolved O2 data, SST
- Weather data: motion corrected wind speed & direction, temperature & humidity
- Fisheries acoustic data/metadata
- Video camera station data & videos
- Vessel position & attitude data: GPS & pitch/roll
- Specimen photographs

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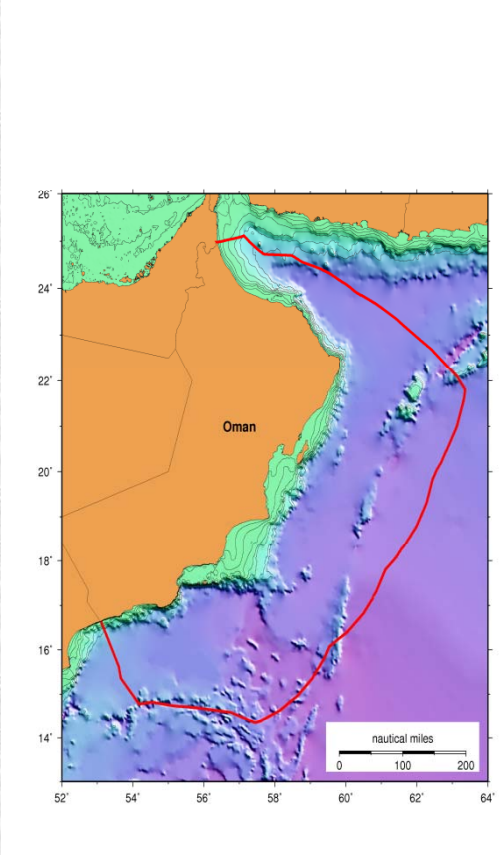
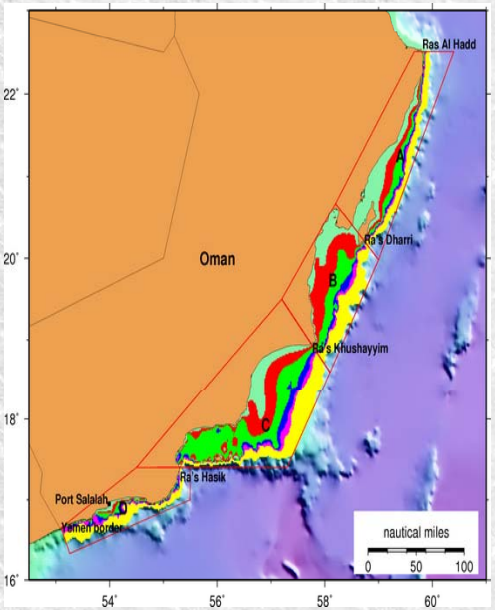
Why?

To provide research vessel quality data capture & management for a 45m commercial trawler used for about 10 months worth of fisheries/oceanographic survey in the Arabian Sea off Oman.





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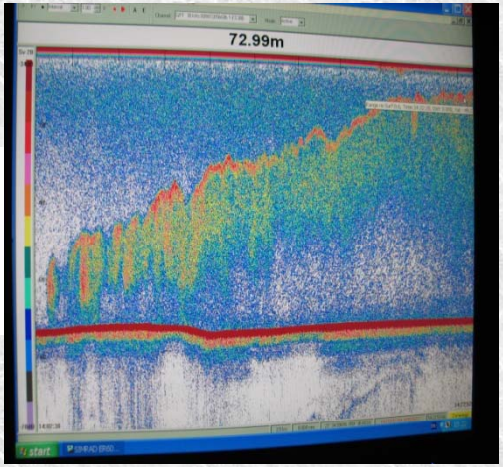
Solution: a mix of hardware & software plus instruments

Shuttle

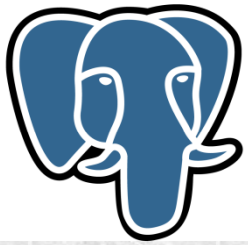
SIMRAD

fedora

Windows



PostgreSQL



GMT

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Solution: a mix of hardware & software plus instruments

Feed all data from all real time instruments onto the network for capture into files & databases.

Capture all non-real time data and upload into database.

Ensure data security by automatic backups to on-line NAS.

Ensure server capability by automatically maintaining a duplicate server able to take over if required.

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Solution: a mix of hardware & software plus instruments

Instrument hardware:

SST: Seabird SBE38 seawater temperature sensor
Weather: Airmar PB-100 integrated weather station
Pitch/roll: Microstrain 3DM-GX1
Position: vessel GPS (NMEA)
Bridge air temperature: Papouch RS232 thermometer
CTD: RBR datalogger (CTD + O2)
Echosounders: 3x Simrad EK60 at 38, 120 & 200 Khz
Satellite comms: ISDN over Inmarsat F77 using Cisco modem/router
Time server: Ships GPS via NTP on networked Linux server

NIWA digital measuring systems

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Solution: a mix of hardware & software plus instruments

Computer related hardware:

4x SFF PC's, 2 Linux, 2 Windows (Shuttle)
3x NIWA fish measuring system controllers
1x general purpose laptop
3x 5 port Gb network switches
1x 400Gb NAS RAID device

HP inkjet printer
2 port KVM switch
APC 800W UPS
8 port serial to ethernet converter (Comtrol DeviceMaster RTS-8)

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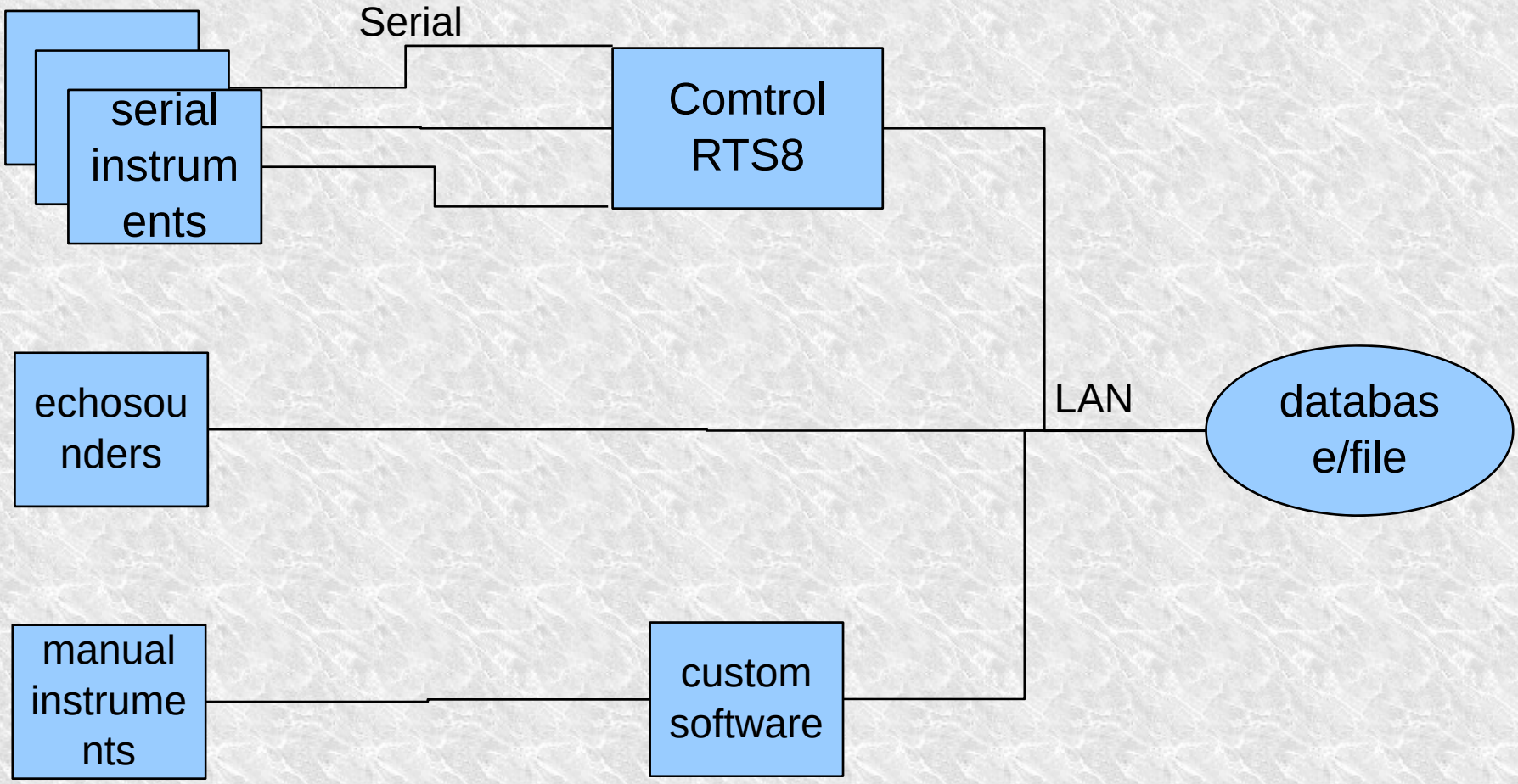
Solution: a mix of hardware & software plus instruments

Software:

Server & w/s O/S: Fedora Core Linux (x2), Windows XP Pro (x2)
Laptop O/S: Windows XP Pro
echosounder software: Simrad ER60
Database: PostGIS & MS Access
Data logging: Aggsoft Advanced TCP/IP data logger
Office suite: MS Office & OpenOffice
Photo manipulation: Adobe Photoshop Elements/GIMP
Basic video editing: RealVNC Viewer
Email: Thunderbird, SquirrelMail
GIS: QGIS, GMT, PostGIS
Windows file backups: Delta Copy

Data capture



(Video: direct to DVD & duplicated manually)

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Data capture

Data from instruments providing a serial output was fed into the Comtrol RTS8 serial to ethernet converter and captured to file by the Advanced TCP/IP data logging software.

Data from devices such as the RTR CTD datalogger were downloaded manually using the appropriate application.

Station data was captured during each station on paper forms & entered into an Access database using a custom Access form.

Catch and biological data (length/weight/stage) was captured using NIWA's custom software, and uploaded into the Access database.

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Data capture

biological data from specimens caught were captured using NIWA's proprietary measuring/recording systems.

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Filesystems & data backup

The Access database is exported to a shared drive on the Linux server.

All data files & photos are stored on shared drives on the Linux server

Linux PostGIS server is rsync'd to replica inactive backup server PC.

Acoustic files are replicated (via DeltaCopy) on the Linux server

All server files are rsync'd to the NAS automatically

PostgreSQL

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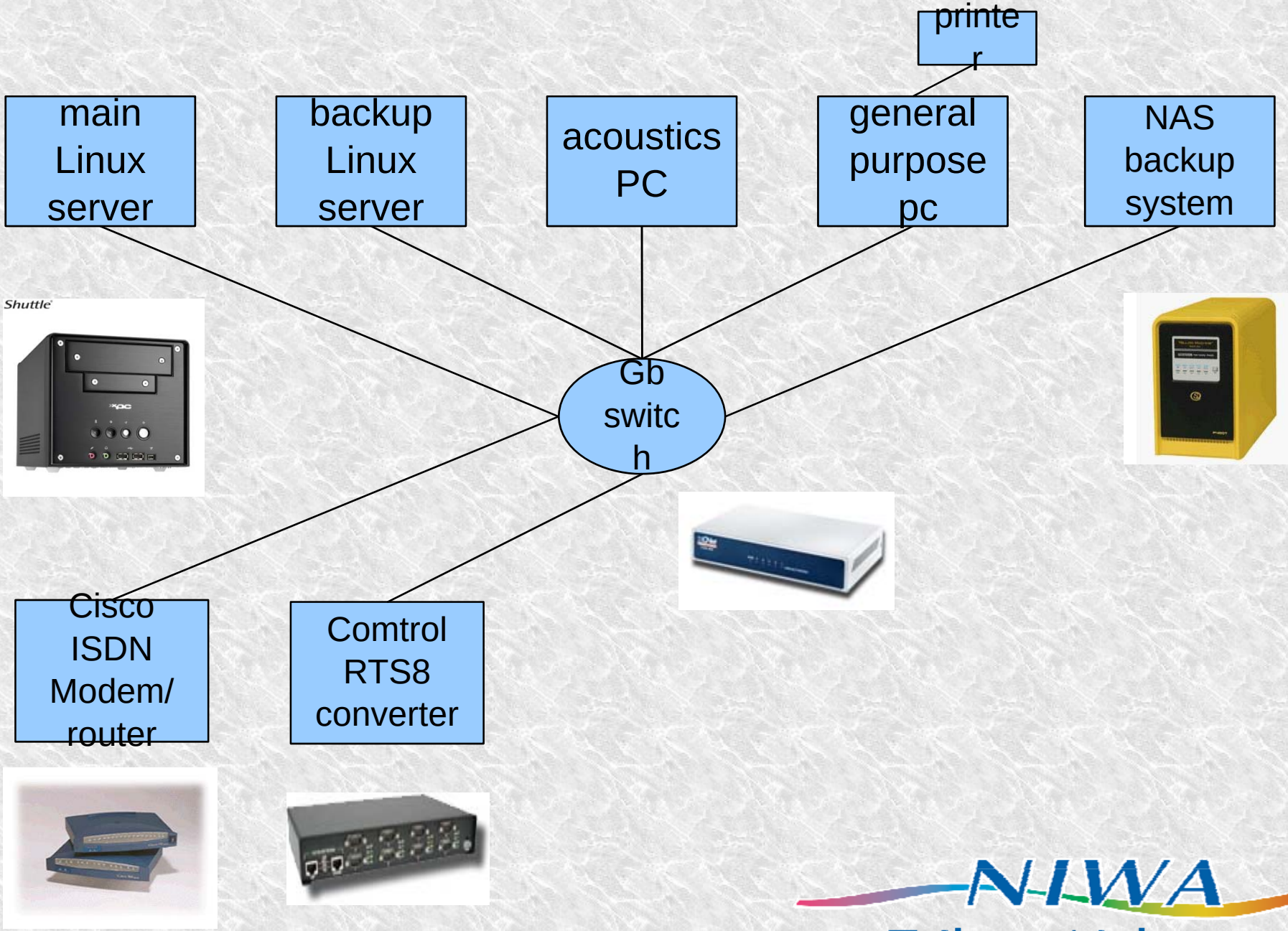
Network



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the GIS stuff!

PostGIS: OGR compliant spatial data management & query tool for the Postgresql RDBMS

QGIS: flexible GUI based data viewer for chaecking & looking at the data in a map context

GMT: command line (script) powerful cartographic tool for semi-automated publication quality map production

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the GIS stuff!

PostGIS: OGR compliant spatial data management & query tool for the Postgresql RDBMS

Essentially adds spatial datatypes, overlay & measurement functions, operators & query capabilities to the free Postgresql RDBMS. Data stored in PostGIS tables can be read directly with several GIS applications, or extracted in a variety of GIS formats.

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the GIS stuff!

PostGIS: OGR compliant spatial data management & query tool for the Postgresql RDBMS

oman=# **\d oman_transect_line;**

Table "public.oman_transect_line"

Column	Type	Modifiers
gid	integer	not null
num	integer	
the_geom	geometry	

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the GIS stuff!

PostGIS: OGR compliant spatial data management & query tool for the Postgresql RDBMS

oman=# **select gid, num, astext(the_geom) from oman_transect_line limit 1;**

```
gid      | 0
num      | 1
astext   | LINESTRING(55.3794847846 17.6524308233142, ...
```

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the GIS stuff!

QGIS: flexible GUI based data viewer for checking & looking at

the data in a map context

QGIS is a free multi-platform GIS package. It can natively open a range of raster, vector & web GIS data formats. It is simple to use, but has limited analysis & cartographic capabilities. It is a useful tool for viewing & checking GIS data.

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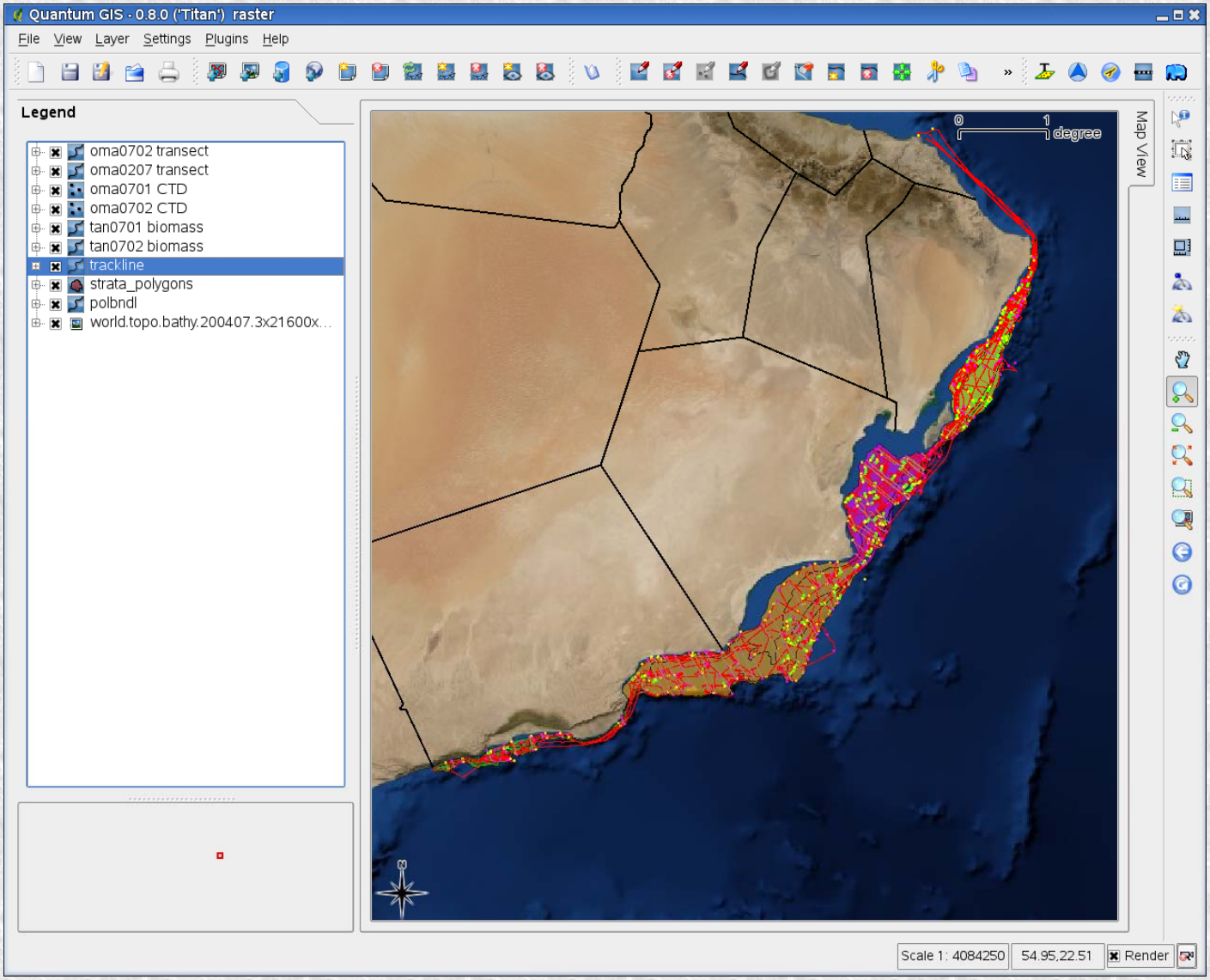
QGIS: flexible GUI based data viewer for checking & looking at the data interactively in a map context.



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the GIS stuff!

GMT: command line (script) powerful cartographic tool for semi- automated publication quality map production.

Generic Mapping Tools is a free command line suite of tools for working with gridded data and producing high quality cartographic output. Scripts to generate publication quality maps from the captured data were a part of the overall system installed on board Al Mustaqila 1.

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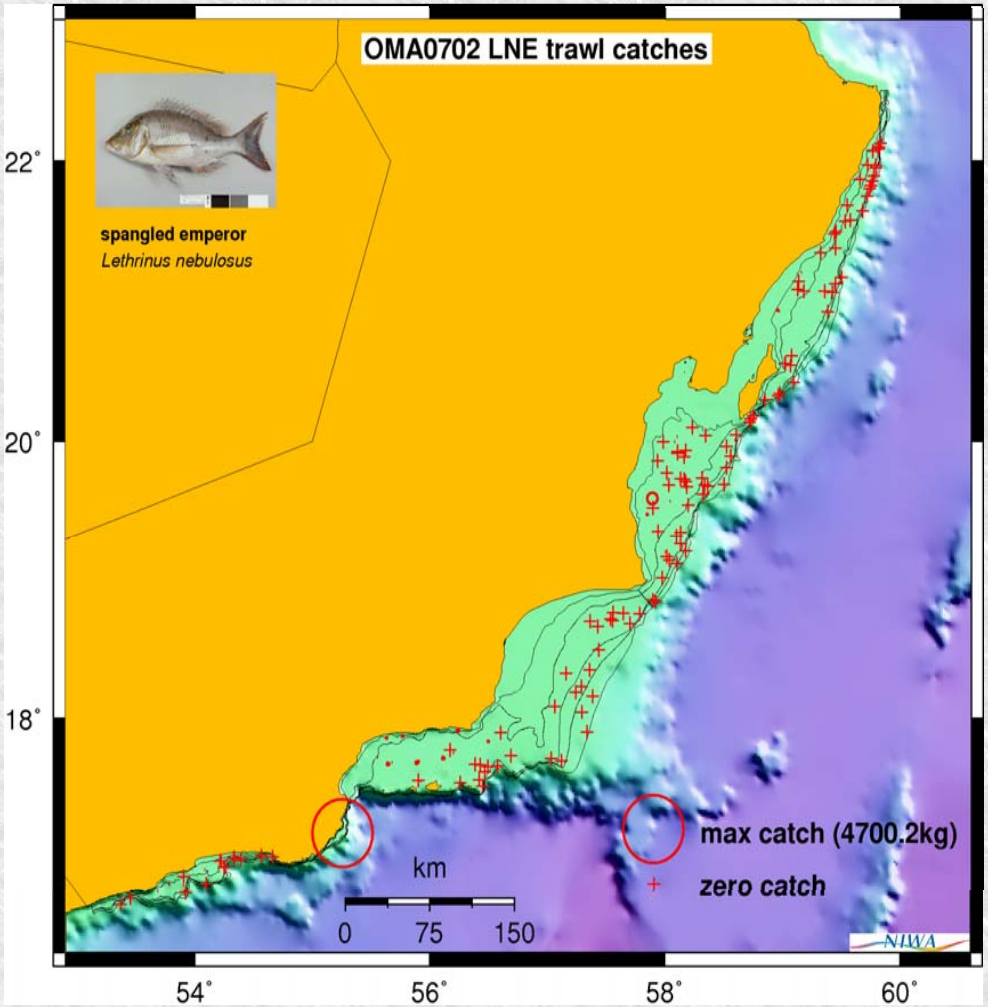
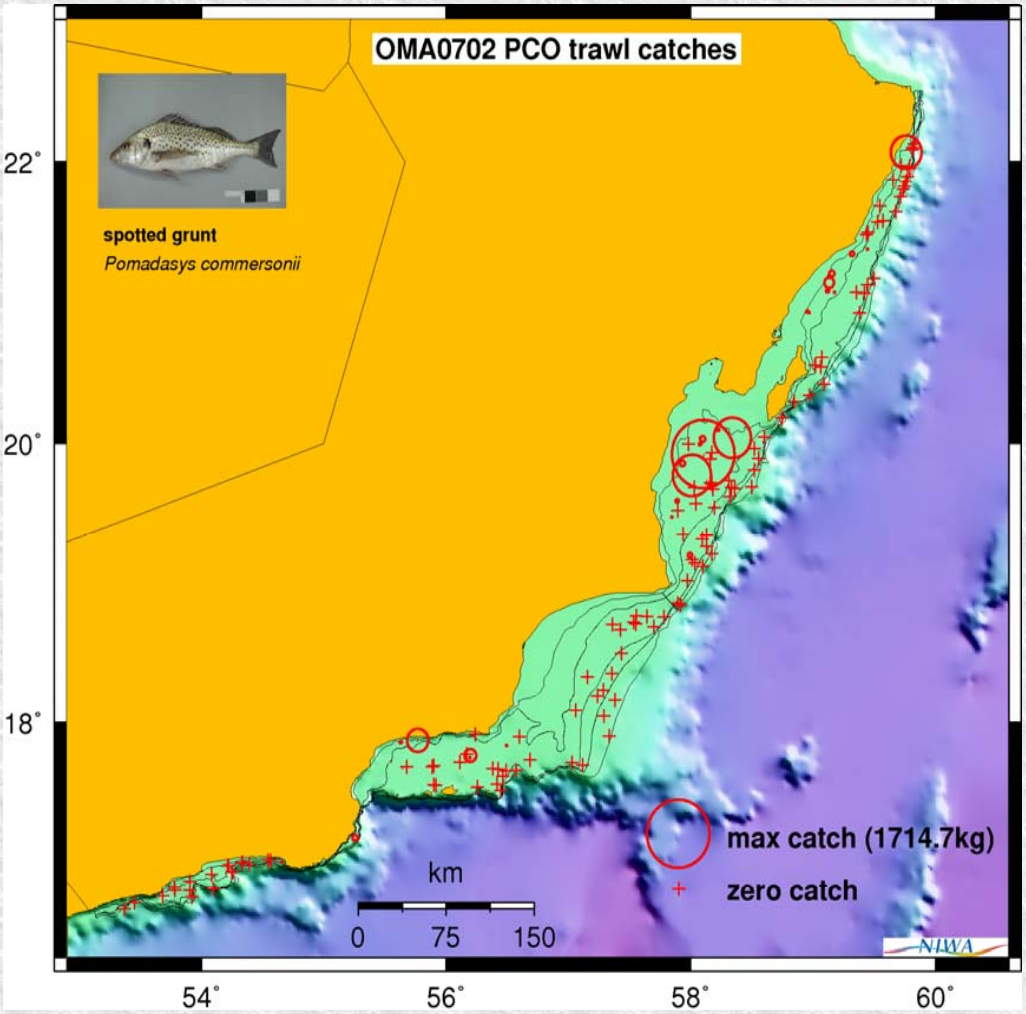
Maps!!

catch by species/trip via GMT





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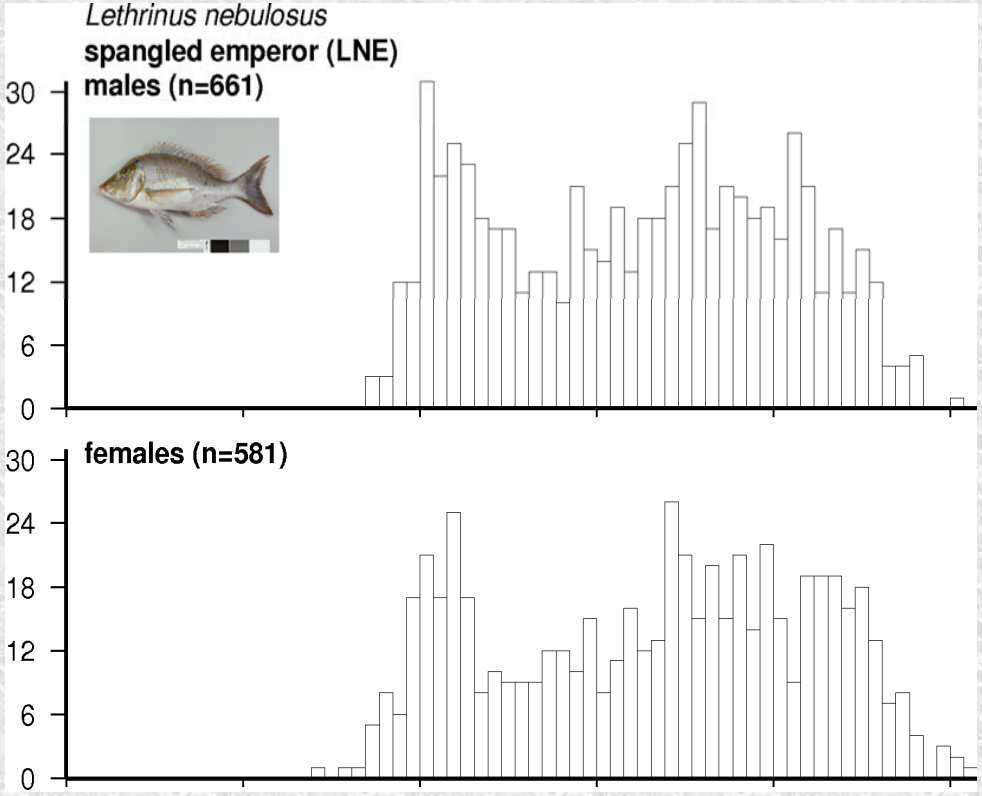
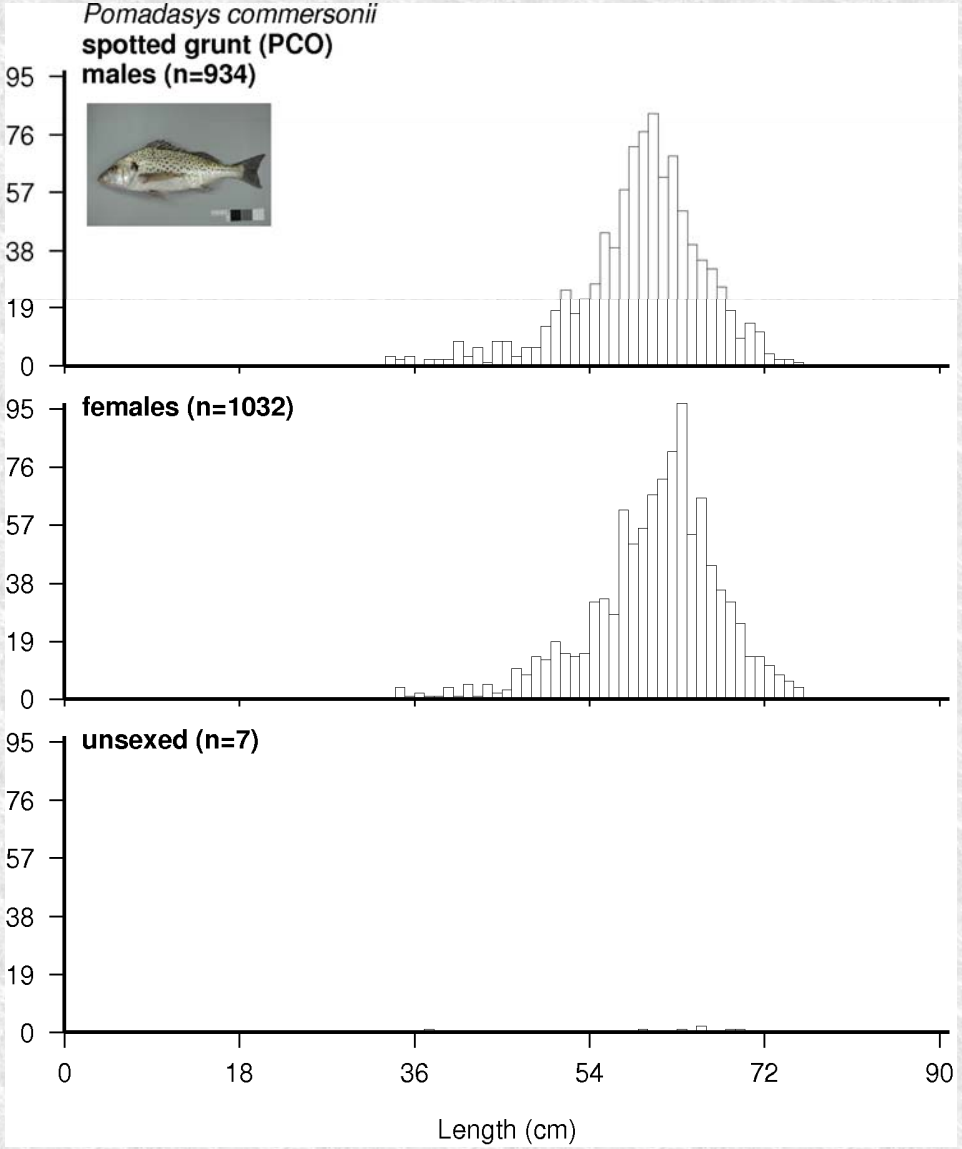
Maps!!

length frequency histograms by GMT





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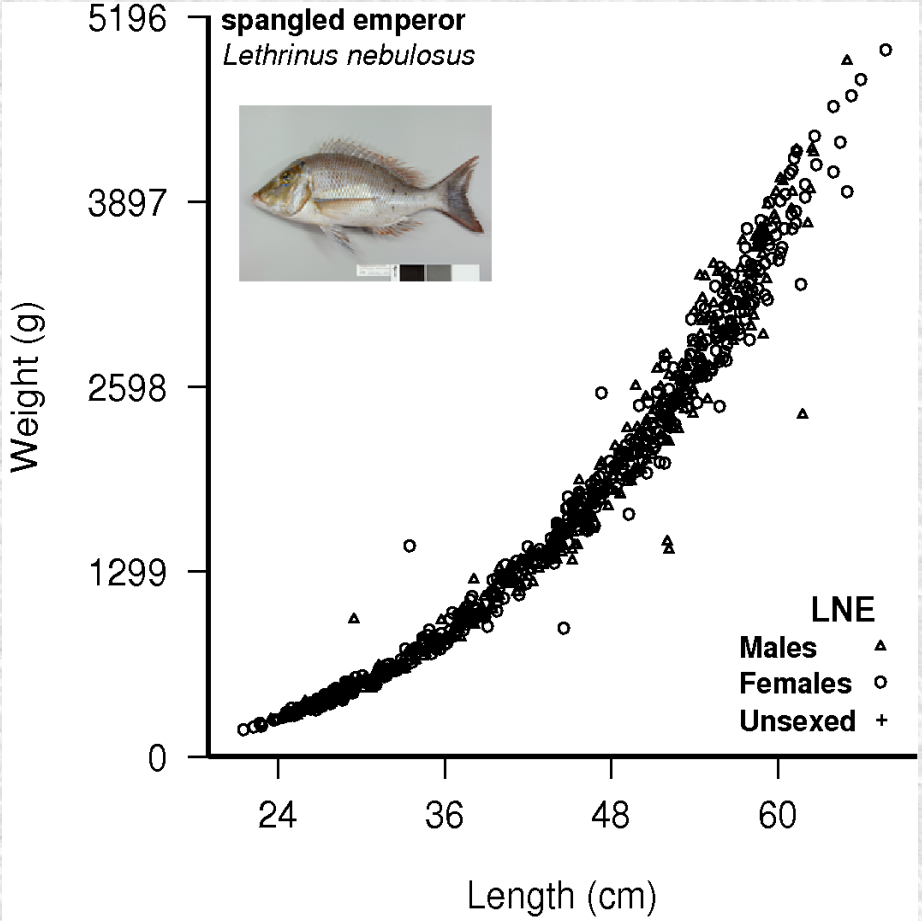
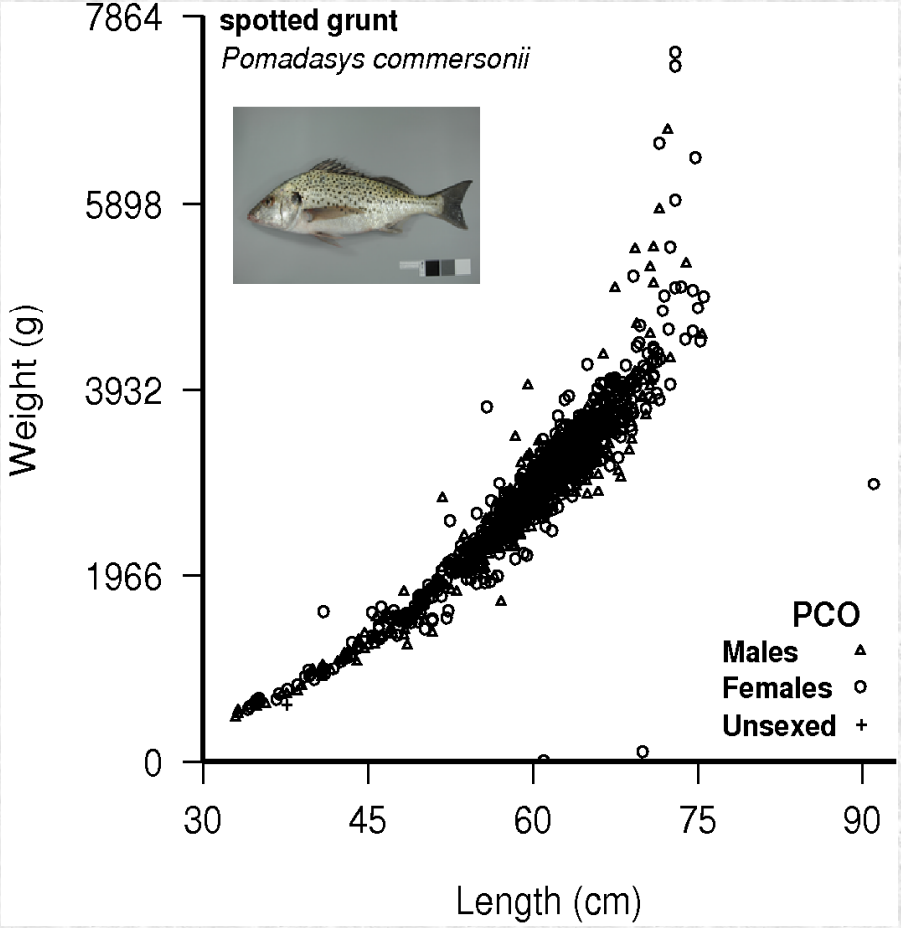
Maps!!

length/weight plots by species via GMT





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Summary

the system as built robustly collected all data captured by
the instruments and other devices and inserted them into
a spatially enabled database supporting interactive GIS
access for data queries and validation as well as on-demand map production for reports.

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Acknowledgements:

NIWA (National Institute for Water and Atmospheric Research

Oman Ministry of Fisheries Wealth

Independent Fisheries Limited

Shallard and Associates

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